

Fourier Transform of Finite-power signal

② Unit Step

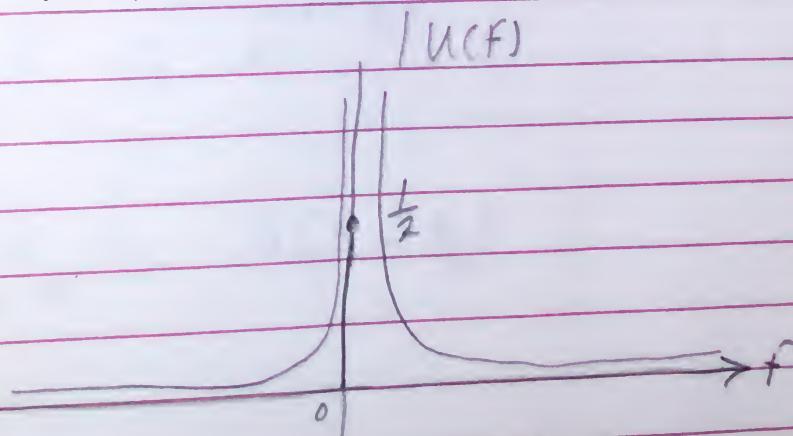
$$u(t) = \begin{cases} 1 & t \geq 0 \\ 0 & t < 0 \end{cases}$$



$$u(t) = \int_{-\infty}^t s(t) dt$$

$$u(t) \xrightarrow{\text{F.T.}} \frac{1}{j2\pi f} + \frac{G(0)}{2} \delta(f)$$

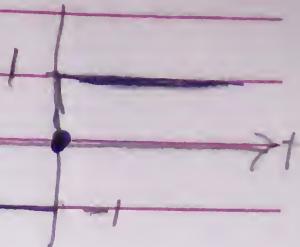
$$u(t) \xleftrightarrow{\text{F.T.}} \frac{1}{j2\pi f} + \frac{\delta(f)}{2}$$



Spectrum of Unit Step

3 Signum Function

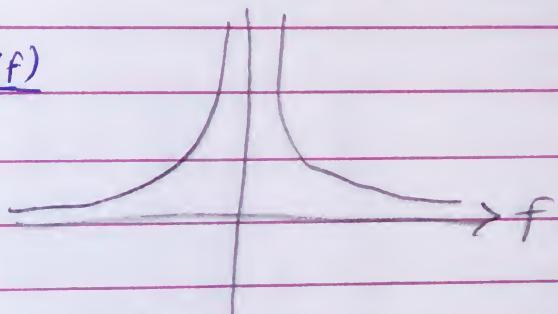
$$\text{sgn}(t) = \begin{cases} 1 & t > 0 \\ 0 & t = 0 \\ -1 & t < 0 \end{cases}$$



$$\begin{aligned} \text{sgn} &= u(t) - u(-t) \\ &= 2u(t) - 1 \end{aligned}$$

|sgn(t)|

$$u(t) \Leftrightarrow \frac{1}{j2\pi f} + \frac{\delta(f)}{2}$$



$$\text{sgn}(t) \Leftrightarrow \frac{1}{j\pi f}$$

Spectrum

4 Periodic Functions

$$g_p(t) = \sum_{n=-\infty}^{\infty} c_n \cdot e^{-j2\pi \frac{n}{T_0} t}$$

$$G_p(f) = \sum_{n=-\infty}^{\infty} c_n \cdot \delta(f - \frac{n}{T_0})$$

Gaussian Function:-

$$g(t) = e^{-\pi t^2}$$

$$G(F) = e^{-\pi f^2}$$

Exponential Function

$$g(t) = e^{-t} \cdot u(t)$$

$$G(F) = \frac{1}{1 + j 2\pi f}$$